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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/981,277 | 10/17/2001 | Janice Nickel | 10991744-4 | 8131 |

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HEWLETT PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER

LEWIS, MONICA

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2822

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|---------------------------------------|--|
| Office Action Summary | Application No. 09/981,277 | Applicant(s) NICKEL, JANICE | |
| | Examiner Monica Lewis | Art Unit 2822 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2004.
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-22 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 12-22 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
 10) ☒ The drawing(s) filed on 17 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to the response filed January 2, 2004.

Drawings

2. The drawings are objected to because it is not clear where 44 and 42 are supposed to be located because there is no line connecting the reference numerals to the drawing (See Figure 2). It is not clear from the drawing that all three reference numbers correspond to the black bar. Although Applicant states that the specification describes where 44 and 42 are located, the drawing fails to illustrate the location. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 13 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear where the angle is formed. Since "grain" lacks antecedence what and/or where are the grains in the structure of the junction or device.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 12, 16, 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Gallagher et al. (U.S. Patent No. 5,640,343).

In regards to claim 12, Gallagher et al. (“Gallagher”) discloses the following:

a) a bottom ferromagnetic layer (16), the bottom ferromagnetic layer having flattened peaks (For Example: See Figure 1b);

b) an insulating tunnel barrier (22) atop the bottom ferromagnetic layer (For Example: See Figure 1b); and

c) a top ferromagnetic layer (24) atop the insulating tunnel barrier (For Example: See Figure 1b).

d) the bottom ferromagnetic layer is flat (For Example: See Figure 1b).

In regards to claim 16, Gallagher discloses the following:

a) the top and bottom layers are AF coupled, wherein the flattened peaks tune the AF coupling to a desired level (For Example: See Column 5 Lines 6-11).

b) bottom layer is flat (For Example: See Figure 1b).

In regards to claim 21, Gallagher discloses the following:

a) a bottom ferromagnetic layer (16) having physically altered peaks (For Example: See Figure 1b);

b) an insulating tunnel barrier (22) atop the bottom ferromagnetic layer (For Example: See Figure 1b); and

c) a top ferromagnetic layer (24) atop the insulating tunnel barrier (For Example: See Figure 1b); and

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d) the bottom ferromagnetic layer is flat (For Example: See Figure 1b).

In regards to claim 22, Gallagher discloses the following:

a) the physically altered peaks are flattened peaks (For Example: See Figure 1b).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as obvious over Gallagher et al. (U.S. Patent No. 5,640,343) in view of Inomata et al. (U.S. Patent No. 6,069,820).

In regards to claim 13, Gallagher fails to disclose the following:

a) angle from the top of a grain to an intersection with an adjacent grain is between about three and six degrees.

However, Inomata et al. ("Inomata") discloses adjacent ferromagnetic grains (18) with an angle between about 3-6 degrees (For Example: See Figure 6). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Gallagher to include adjacent ferromagnetic grains with an angle between about 3-6 degrees as disclosed in Inomata because it aids in providing energy levels that are in quantization (For Example: See Column 10 Lines 13-23).

Gallagher and Inomata are both from the same field of endeavor, the purpose disclosed by Inomata would have been recognized in the pertinent art of Gallagher.

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9. Claim 14 is rejected under 35 U.S.C. 103(a) as obvious over Gallagher et al. (U.S. Patent No. 5,640,343) in view of Anthony (European Patent No. EP0929110A1).

In regards to claim 14, Gallagher fails to disclose the following:

a) the flattened peaks have a valley peak height difference of no more than one nanometer.

However, Anthony discloses the use of ferromagnetic materials with a thickness of no more than about one nanometer (For Example: See Paragraph 39). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Gallagher to include the use ferromagnetic materials with a thickness of no more than about one nanometer as disclosed in Anthony because it aids in enhancing the magneto-resistance (For Example: See Paragraph 39).

Gallagher and Anthony are both from the same field of endeavor, the purpose disclosed by Anthony would have been recognized in the pertinent art of Gallagher.

Finally, the applicant has not established the critical nature of the valley to height difference of no more than about one nanometer. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

10. Claim 15 is rejected under 35 U.S.C. 103(a) as obvious over Gallagher et al. (U.S. Patent No. 5,640,343) in view of Chen et al. (U.S. Patent No. 5,953,248).

In regards to claim 15, Gallagher fails to disclose the following:

a) the junction has a resistance of less than about $10\text{ K}\Omega\text{-}\mu\text{m}^2$.

However, Chen et al. ("Chen") discloses a junction resistance of 10 kohms (For Example: See Column 4 Lines 38-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Gallagher to include a junction resistance of 10 kohms as disclosed in Chen because it aids in enabling current to flow through the layer (For Example: See Column 4 Lines 34-43).

Additionally, the applicant has not established the critical nature of the resistance of less than about $10\text{ K}\Omega\text{-}\mu\text{m}^2$. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

Finally, since Gallagher and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Gallagher.

11. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as obvious over Gallagher et al. (U.S. Patent No. 5,640,343) in view of Anthony (European Patent No. EP0929110A1).

In regards to claim 17, Gallagher discloses the following:

a) an array of memory cells (9), each memory cell including an SDT junction, each SDT junction including a bottom ferromagnetic layer, each bottom ferromagnetic layer having an upper surface (For Example: See Figure 1a and Figure 1b);

b) a plurality of word lines (1, 2 and 3) extending memory cell rows of the array (For Example: See Figure 1a); and

c) a plurality of bit lines (4, 5 and 6) extending along memory cell columns of the array (For Example: See Figure 1a).

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In regards to claim 17, Gallagher fails to disclose the following:

a) each upper surface having a valley-to-peak height variation of no more than about one nanometer.

However, Anthony discloses the use of ferromagnetic materials with a thickness of no more than about one nanometer (For Example: See Paragraph 39). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Gallagher to include the use ferromagnetic materials with a thickness of no more than about one nanometer as disclosed in Anthony because it aids in enhancing the magneto-resistance (For Example: See Paragraph 39).

Gallagher and Anthony are both from the same field of endeavor, the purpose disclosed by Anthony would have been recognized in the pertinent art of Gallagher.

Finally, the applicant has not established the critical nature of the valley to height difference of no more than about one nanometer. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

In regards to claim 18, Gallagher discloses the following:

a) resistance variation of the junctions across the entire array is no more than about 4% (For Example: See Column 6 Lines 29-32).

Additionally, the applicant has not established the critical nature of the resistance variation of the junctions across the entire array is no more than about 4%. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range

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or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

12. Claim 19 is rejected under 35 U.S.C. 103(a) as obvious over Gallagher et al. (U.S. Patent No. 5,640,343) in view of Anthony (European Patent No. EP0929110A1) and Inomata et al. (U.S. Patent No. 6,069,820).

In regards to claim 19, Gallagher fails to disclose the following:

a) angle from the top of a grain to an intersection with an adjacent grain is between about three and six degrees.

However, Inomata discloses adjacent ferromagnetic grains with an angle between about 3-6 degrees (For Example: See Figure 6). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Gallagher to include adjacent ferromagnetic grains with an angle between about 3-6 degrees as disclosed in Inomata because it aids in providing energy levels that are in quantization (For Example: See Column 10 Lines 13-23).

Finally, since Gallagher and Inomata are both from the same field of endeavor, the purpose disclosed by Inomata would have been recognized in the pertinent art of Gallagher.

13. Claim 20 is rejected under 35 U.S.C. 103(a) as obvious over Gallagher et al. (U.S. Patent No. 5,640,343) in view of Anthony (European Patent No. EP0929110A1) and Chen et al. (U.S. Patent No. 5,953,248).

In regards to claim 20, Gallagher fails to disclose the following:

a) the junction has a resistance of less than about $10 \text{ K}\Omega\text{-}\mu\text{m}^2$.

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However, Chen discloses a junction resistance of 10 kohms (For Example: See Column 4 Lines 38-43). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Gallagher to include a junction resistance of 10 kohms as disclosed in Chen because it aids in providing current to flow through the layer (For Example: See Column 4 Lines 34-43).

Additionally, the applicant has not established the critical nature of the resistance of less than about $10\text{ K}\Omega\text{-}\mu\text{m}^2$. “The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.” *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990).

Finally, since Gallagher and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Gallagher.

Response to Arguments

14. Applicant's arguments filed 1/2/04 have been fully considered but they are not persuasive. First, Applicant argues that Gallagher et al. (“Gallagher”) fails to disclose “a bottom ferromagnetic layer having flattened peaks or peaks that have been otherwise physically altered.” However, claim 12 merely requires that the ferromagnetic layer have flattened peaks. Gallagher discloses that the tunneling barrier layer has a planar surface area hence the formation of the tunneling barrier layer on top of the ferromagnetic layer will result in the bottom layer having “flattened peaks” (For Example: See Figure 1b). Since the claim is a product claim, the bottom ferromagnetic layer can be flattened by any method in order to render the claims obvious.

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Second, Applicant argues that Gallagher fails to disclose “physically altered peaks.” However, the formation of the tunneling barrier layer will result in the peaks of the ferromagnetic layer being “physically altered,” since the tunneling barrier layer is formed on top of the ferromagnetic layer. Finally, the structure of Gallagher shown in Figure 2 depicts layers having flat planar surfaces, it is argued that the layer of Gallagher has a valley to peak height variation of zero, which is encompassed in the claimed range of “no more than about one nanometer.”

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML

March 18, 2004

Mary Wilczewski
Primary Examiner